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EXAMINER

YAM, STEPHEN K

ART UNIT	PAPER NUMBER
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2878

DATE MAILED: 02/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/914,515

Applicant(s)

HEINTZMANN ET AL.

Examiner

Stephen Yam

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-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 October 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Drawings***

1. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

### ***Claim Objections***

1. Claims 1, 3, 4, 8, 9, 14, and 17 are objected to because of the following informalities:

In Claim 1, line 4, "the light" lacks proper antecedent basis.

In Claim 1, line 4, "the object point" lacks proper antecedent basis.

In Claim 1, line 6, "the object structure" lacks proper antecedent basis.

In Claim 3, line 3, "the object characteristics" lacks proper antecedent basis.

In Claim 4, line 5, "an object point" lacks proper antecedent basis, as parent claims 1 and 2 already indicate an object point.

In Claim 8, line 2, "the mask" lacks proper antecedent basis, as the pattern as described can be generated by "a mask *or* by interference" which renders the "mask" optional.

In Claim 9, "the illumination intensity" lacks proper antecedent basis

In Claim 14, line 7, "the light" lacks proper antecedent basis.

In Claim 17, "the sample" lacks proper antecedent basis.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

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2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding Claim 1, it is unclear where "the light" is introduced, as the claim language does not specify a light source or a basis for receiving light from an external location.

Claims 2-13 are indefinite by virtue of their dependency on an indefinite claim.

### ***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-9, 11, 13-17, 19, 20, and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Wilson et al. PCT Publication WO 98/45745.

Regarding Claim 1, Wilson et al. teach (see Fig. 1) a process for obtaining an object image of at least one object (O) by capturing at least two partial images of the object (see Page 7, paragraph 3) under differing object conditions which are formed on the object with spatial patterns (see Page 5, paragraph 6), wherein dependence of the light detectable from the object point on the object conditions obtained at the object point exists (see Page 8, paragraphs 1 and 2)

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and the partial images contain (see Page 6, paragraph 4 and 7, paragraph 3) different contributions of various space frequency components of the object structure, and determining (see Page 6, paragraph 4) the desired object image from the partial images by reconstruction of the space frequency components. Inherently, the interference patterns formed through a phase mask or grating are non-linear in intensity.

Regarding Claim 14, Wilson et al. teach (see Fig. 1) an optical imaging system comprising an illumination device (10) and a detector device (13) arranged for illuminating an object (O) and recording (17) an image of the object, at least one pattern generator (14) for generating at least one changeable spatial pattern (see Page 5, paragraph 6) of object conditions on the object, with the pattern generator arranged for generating object conditions on which light detectable by the detector device is non-linearly dependent (as inherently, the interference patterns formed through a phase mask or grating are non-linear in intensity), and an image generator (19) for reconstruction of an image from partial images which were recorded with the detector device.

Regarding Claim 2, Wilson et al. teach the spatial patterns of at least one object condition (1-dimensional grating) (see Page 5, paragraph 5) formed, for each of which the non-linear dependence of the detected light emitted from the object point exists (since inherently, the interference patterns formed through a phase mask or grating are non-linear in intensity).

Regarding Claim 3, Wilson et al. teach spatial patterns formed by at least two object conditions (2-dimensional grating) (see Page 7, paragraph 4), for which a dependence of the detected light on a multiplicative linking of object characteristics (since the diffractive patterns in each direction are linked into a single grating) and a non-linear dependence of the detected light

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on each of the object conditions exists (since inherently, the interference patterns formed through a mask or grating are non-linear in intensity).

Regarding Claim 4, Wilson et al. teach the spatial pattern given by a pattern of an illumination intensity on the object (see Page 5, paragraph 5), and the object illuminated with the pattern in such a way that a non-linear dependence of the light intensity, detected at a detector device (13) (see Fig. 1), coming out from an object point to the illumination intensity obtained at this object point, exists (since inherently, the interference patterns formed through a mask or grating are non-linear in intensity).

Regarding Claim 5, Wilson et al. teach the non-linear dependence of the detected light formed by a dependence of the phase on the scatter light on the illumination intensity present in the object (see Page 5, paragraph 6, and Page 6, paragraph 4).

Regarding Claim 6, Wilson et al. teach the spatial pattern of an object condition in reciprocal space formed spatially periodically (see Page 5, paragraph 5).

Regarding Claim 7, Wilson et al. teach the object and the spatial pattern displaced (see Page 5, paragraph 6) in one or more direction relative to one another to achieve various object conditions.

Regarding Claim 8, Wilson et al. teach the pattern generated by a mask (see Page 5, paragraph 5), and a displacement of the mask is achieved by displacement of the phase (see Page 5, paragraph 6 and Page 6, paragraph 3).

Regarding Claim 9, Wilson et al. teaches object conditions changed according to a predetermined temporal structure and the partial images taken at various times (see Page 10, paragraph 1).

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Regarding Claim 11, Wilson et al. teach the reconstruction of the object image from the partial images performed by solving an equation system (see Page 7, paragraph 1).

Regarding Claim 13, Wilson et al. teach reconstruction of the object image performed by consideration of parts of the object (see Page 6, paragraph 4).

Regarding Claim 15, Wilson et al. teach the pattern generator comprising a mask (see Page 5, paragraph 5) with which a spatial pattern of an illumination intensity can be formed on the object.

Regarding Claim 16, Wilson et al. teach the mask comprising a phase grating (see Page 5, paragraph 5).

Regarding Claim 17, Wilson et al. teach the mask and the object positioned so they are movable relative to one another (see Page 5, paragraph 6).

Regarding Claim 19, Wilson et al. teach the pattern generator comprising a device for achieving predetermined physical conditions (illumination of object by a periodic pattern) (see Page 5, paragraph 5) on the object.

Regarding Claim 20, Wilson et al. teach an adjustment device (15) for displacement of the object in the spatial pattern of the object conditions (see Page 5, Paragraph 5) is provided.

Regarding Claim 22, Wilson et al. teach (see Fig. 1) an illumination optic (11) provided.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson et al.

Wilson et al. teach the process as taught in Claims 1, 2, and 3, according to the appropriate paragraph above. Wilson et al. do not teach establishing the position of the object or one or more partial objects of the object. It is well known in the art that objects are aligned in a microscope using reference points so that a proper 3-dimensional mapping of the surface is used to determine the layout or imperfections of a sample, such as detecting for defects in a semiconductor substrate. It would have been obvious to one of ordinary skill in the art at the time the invention was made to establish the position of the object in the process of Wilson et al., to provide a point of reference in which to properly map the object and analyze the detected data.

5. Claims 10 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson et al. in view of Spink et al. US Patent No. 5,841,149.

Regarding Claim 10, Wilson et al. teach the process as taught in Claims 1, 2, and 3, according to the appropriate paragraph above. Wilson et al. do not teach varying the illumination intensity to generate different object conditions. Spink et al. teach a method of determining distance of a feature on an object, comprising a light source (64a) (see Fig. 3) which is varied in intensity (see Col. 6, lines 35-40) to determine distance from a detected phase shift using an interference pattern (see Col. 8, lines 11-16). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the vary the intensity of the illumination as taught by Spink et al. in the process of Wilson et al., to provide a distance



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measurement between the device and the object as desired by Wilson et al. (see Page 6, paragraph 4) in a microscope as taught by Spink et al. (see Col. 6, lines 50-60).

Regarding Claim 21, Wilson et al. teach the system as taught in Claims 14-16, 19, and 20, according to the appropriate paragraph above. Wilson et al. do not teach the illumination device comprising a flash lamp, laser or high-pressure lamp. Spink et al. teach an optical system for determining distance of a feature on an object, comprising a light source (64a) (see Fig. 3), interference pattern (see Col. 8, lines 11-16), and optical detector (76), where the illumination device comprises a laser (see Col. 6, lines 35-38). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a laser as taught by Spink et al. in the system of Wilson et al., to provide a confined, high-intensity light beam through the mask to generate distinct interference patterns on the object that can be easily detected.

6. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wilson et al. in view of Aziz et al. US Patent No. 5,640,270.

Wilson et al. teach the system as taught in Claim 14, according to the appropriate paragraph above. Wilson et al. do not teach a mirror assembly arranged for generating an interference pattern on the object. Aziz et al. teach (see Fig. 1) a system for phase-shifting interferometry for a microscope with an illumination device (12), a detector device (28), and a pattern generator (20) comprising a mirror assembly (26), arranged for generating an interference pattern (see Col. 3, lines 52-56 and Col. 3, line 64 to Col. 4, line 4) on an object (S). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the

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mirror assembly of Aziz et al. to produce the interference patterns in Wilson et al., to utilize the system in vertical scanning environments, as taught by Aziz et al. (see Col. 2, lines 10-38).

### ***Conclusion***


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Stephen Yam whose telephone number is (703)306-3441. The examiner can normally be reached on Monday-Friday 8:30am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (703)308-4852. The fax phone numbers for the organization where this application or proceeding is assigned are (703)308-7724 for regular communications and (703)308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0956.

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SY  
January 22, 2003

  
**DAVID PORTA**  
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